



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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2-403

Applicants: STUART A. SANDERS ET AL.      Docket No.: 01-414  
Serial No.: 09/943,321      Examiner : A. Jackson  
Filed : August 30, 2001      Art Unit : 3677  
For : ABRADABLE SEAL HAVING  
IMPROVED DURABILITY

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SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

Hon. Commissioner of Patents and Trademarks  
United States Patent & Trademark Office  
Washington, D.C. 20231

Dear Sir:

In compliance with Applicants' continuing duty of disclosure, the following patent documents are brought to the Examiner's attention.

- (1) European Patent Application 0 939 143;
- (2) U.S. Patent No. 4,664,973;
- (3) U.S. Patent No. 4,336,276; and
- (4) U.S. Patent No. 3,834,001.

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The above-referenced patent documents were cited in a search report issued in a corresponding European patent application.

The European Patent Application to Ticona GmbH relates to a thermal spray powder incorporating a high temperature polymer. Powders of oxidized polyarylene sulfide and powders comprising from 1 to 99% by weight of oxidized polyarylene sulfide and from

1 to 99% by weight of a metal, carbide, ceramic or high temperature polyimide, polyamide imide, polyester imide and aromatic polyester plastic, or a mixture thereof are suitable for use in thermal spraying and thereby form coatings having a strong chemical and mechanical resistance and high dimensional stability when exposed to high and low temperatures. Such coatings are advantageous for use as abradable seal clearance control coating in the compressor section of gas turbine engines, motor vehicle turbochargers and superchargers and for use as a coating of reaction vessels, kitchen ware, sealings or bearings.

U.S. Patent No. 4,664,973 to Otfinoski et al. relates to porous metal structures useful as abradable seals in axial flow compressors. The seals are comprised of 1-30 weight percent oxide and have 27-38 percent of the solid metal density. A preferred seal is made by plasma arc spraying a mixture of 80Ni-20Cr and polymethylmethacrylate powders and then heating the resultant deposited air to about 315°C to cause the polymer to flee. The nichrome seal will have less than 15 percent oxide and a density of about 2.7 g/cm<sup>3</sup>, about 32 percent of the solid metal density.

U.S. Patent No. 3,834,001 to Carroll et al. relates to a porous seal element usable as a blade tip seal in a turbomachine or as an element of a labyrinth seal. The porous seal element is made up of a large number of strips disposed edgewise to the sealing face of the element and extending in the direction of relative movement of the seal elements. The strips have grooves extending across the strip for discharge of a cooling fluid such

as air. The presence of the grooves provides a low density structure at the seal face of the seal element which may be abraded if there is rubbing contact and provides for metering of coolant at the rear face of the seal element. The seal element is fabricated by etching sheets so each sheet defines a number of parallel strips joined by weak ties and with the grooves extending across the strips; stacking the sheets and bonding them together; and then separating the bonded structure at the weak ties so that each stack of strips defines a seal element.

U.S. Patent No. 4,336,276 to Bill et al. relates to a seal having a high temperature abradable lining material encircling the tips of turbine blades in turbomachinery. The invention is particularly directed to maintaining the minimum operating clearances between the blade tips and the lining of a high pressure turbine. A low temperature easily decomposable material, such as a polymer, in powder form is blended with a high temperature oxidation resistant metal powder. The two materials are simultaneously deposited on a substrate formed by the turbine casing. Alternately, the polymer-powder may be added to the metal powder during plasma spraying. A ceramic layer is then deposited directly onto the metal-polymer composite. The polymer additive mixed with the metal is then completely volatilized to provide a porous layer between the ceramic layer and the substrate. Thermal stresses are reduced by virtue of the resulting porous structure which affords a cushion effect. By using only plasma spraying for depositing both the powders of the


metal and polymer material, as well as the ceramic powder, no brazing is required.

Copies of the aforementioned patent documents and a listing on Form PTO-1449 are enclosed herewith.

None of the above-referenced patents are believed to negate the patentability of the present invention.

Respectfully submitted,

STUART A. SANDERS ET AL.

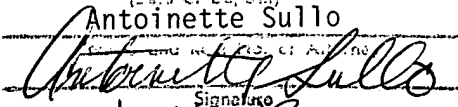
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Date: January 14, 2003

I hereby certify that this correspondence is true and correct and is being deposited with the United States Postal Service as first class mail in an envelope addressed for Commissioner of Patents and Trademarks, Washington, D.C. 20590

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